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ROCKS and MINERALS

A Magazine for Mineralogist, Geologist and Collector . . .

. . . . . *Official Journal of The Rocks and Minerals Association*

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THE ROCKS AND MINERALS ASSOCIATION

PEEKSKILL, N. Y.

Organized in 1928 for the increase and dissemination of mineralogic knowledge.

To stimulate public interest in geology and mineralogy and to endeavor to have courses in these subjects introduced in the curricula of the public school systems; to revive a general interest in minerals and mineral collecting; to instruct beginners as to how a collection can be made and cared for; to keep an accurate and permanent record of all mineral localities and minerals found there and to print same for distribution; to encourage the search for new minerals that have not yet been discovered; and to endeavor to secure the practical conservation of mineral localities and unusual rock formations.

Ever since its foundation in 1928, the Rocks and Minerals Association has done much to promote the interest in mineralogy. It has sponsored outings, expeditions, formations of mineralogical clubs and the printing of many articles that have been a distinct contribution to mineralogy.

Those of our readers who are members of the Association can rightly feel that they too were sponsors of these many achievements that have helped to give mineralogy a national recognition. Among your friends there must be many who would like to have a part in the Association's work—to share with you the personal satisfaction, the pleasure, and the benefits of membership. Will you give your friends this opportunity to join the Association by nominating them for membership? A nomination blank will be found elsewhere in this issue.

Each new member helps to extend the Association's activities—helps to make your magazine larger,better, and more interesting, and above all assists in the dissemination of mineralogical knowledge.

Some advantages of membership: All members in good standing receive:

(1) **Rocks and Minerals,** a monthly magazine. (2) A member's identification card that secures the privileges of many mines, quarries, clubs, societies, museums, libraries. (3) The right to participate in outings and meetings arranged by the Association. (4) The right to display a certificate of membership and to place after their names a designation indicating their membership or to advertise membership on stationary, etc. (5) The distinction and the endorsement which comes from membership in the world's largest mineralogical society.

The following clubs are affiliated with the Rocks and Minerals Association:

Canon City Geology Club, F. C. Kessler, Sec., Canon City, Colo.

National Geological Club, Mrs. D. P. Stockwell, Pres., Mt. Olympus, Kimmswick, Mo.

Reno Rocks and Minerals Study Club, Mrs. Rader L. Thompson, Sec., R.F.D. 1, Box 225A, Reno, Nev.

Rocks and Minerals Association of North Jersey, Dover, N. J.

Queens Mineral Society, Miss Bernadette Reis, Sec., 10314-97th Ave., Ozone Park, L.I., N.Y.

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PETER ZODAC

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Courtesy U. S. National Museum.

AZURITE

COPPER QUEEN MINE, BISBEE, ARIZONA

AZURITE

Of the many varieties of copper minerals, azurite furnishes the most beautiful crystallized specimens; indeed the best of them are among the most magnificent of all mineral specimens. Beautiful as is azurite, it is quite plentiful so that even modest mineral collections can boast of fine specimens.

Azurite is a carbonate of copper and owes its name to its very fine azure-blue color. It has been and still is to some extent known by a number of other names as azure copper ore, blue carbonate of copper, blue copper, blue malachite, chessy copper, chessylite, hydrocarbonate of copper, prismatic blue malachite, striated mountain blue, and velvet blue copper.

Azurite is an important copper ore in many localities where it is commonly associated with malachite. This association is so prevalent that massive specimens, in which the two are so intimately associated as to take a beautiful polish and be used as gems for rings, pins or as ornaments, are commonly called azurmalachite.

Years ago magnificent specimens were common from the Copper Queen mine of Bisbee, Arizona. Masses of bright green malachite were often encrusted on the top by groups of deep blue azurite crystals, the two presenting such gorgeous specimens that no one could resist purchasing them when they were offered for sale.

Azurite in splendid crystallizations was also common years ago in another copper mine, at Chessy, near Lyons, France. In fact the crystals of azurite from this mine were the finest known, and were called chessylite and chessy copper. Spherical concretions of azurite, mostly about the size of walnuts, were also found here; the concretions were balls of tiny crystals.

Fine azurite crystals have been found at Nizhni Tagilsk, in the Ural Mountains of western Siberia, in a copper mine which was famous for its large masses of gemmy malachite.

Today, the finest azurite specimens come from Tsumeb, in Southwest Africa, where they are also associated with malachite. Some of them have completely altered into malachite, forming pseudomorphs; the original azurites have retained their forms so perfectly that they can easily be identified.

Azurite is frequently found at many mines whose ores are not copper. Stone quarries likewise often expose the mineral. In practically all cases, azurite occurs only as a bluish stain or crust on minerals or rocks as an alteration product of chalcopyrite. In other words, if chalcopyrite is found at a locality, even though in small grains, azurite may also be found.

CHIPS FROM THE QUARRY

(EDITORIAL PAGE)

We Make Our Bow

PETER ZODAC

While no issue of this magazine has ever gone forth without some contribution, anonymous or credited to the Editor, he has long desired a special page where he could indulge himself in such flights of fancy, words of commendation or advice, quips of wisdom or whatever else might at the moment be passing through the editorial brain. We therefore make our bow to our reading audience and announce that hereafter this will be the editorial page.

It is unnecessary to state that anyone appearing before an audience finds his greatest stimulation when he faces a packed house or realizes there is standing room only.

While it is not without some feeling of pride that we are conscious of already addressing a large and a very intelligent audience, we should like to see it doubled, even trebled, because we know that our magazine is worthy of a larger number of readers. In other words we believe there are many people worthy of being numbered among the Rocks and Minerals Association membership and having the opportunity to enjoy the monthly issues of the **Rocks and Minerals Magazine.** And because of our confidence in the merits of the magazine and the advantages of membership in the Association, we are calling upon our loyal friends, in this issue, to bring one of their friends into the fold of membership. This can be done in several ways.

We suggest a year's subscription as a gift to some friend who has expressed an interest in mineralogy. To show the magazine to others who they think would be interested in its articles. To call the attention of the teachers of science in schools and colleges to the magazine as background material for their students. Or if you are a member of a mineral club, have the club make the magazine its official journal and receive a copy each month for its library or reading table.

Of course it goes without saying that when your subscription expires it should be renewed. It is the renewing of all subscriptions by our loyal friends which makes it possible for **Rocks and Minerals** to grow and prosper. It is upon these friends that we naturally look for our greatest support.

First and last, let us make this a banner year in enlarging the Association's membership thus further promoting the purposes of the magazine and of the Association in carrying forward those ideals expressed in the article on the inside cover of this issue.

Peter Zodac

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WHOLE NO. 78

TONOPAH

By JOHN L. BAUM

Harvard University, Cambridge, Massachusetts

A hot May wind was blowing up the fourteen mile slope, a wind laden with stinging sand. Jim Butler sought his wandering burros in the blast, and finding them behind a sheltering outcrop, he awaited there the end of the wind. As prospectors habitually do, he broke off some rock, which seemed to have traces of mineral in it. Eventually, in his casual way, Butler got an assay on his specimens, which proved to be ore worth over five hundred dollars to the ton. After a while he got around to returning to his find which, because he hadn't marked it, was still untouched by the prospectors drawn to the area by the rumors of Butler's strike. Once more camped beside his sheltering outcrop, Jim Butler in August, 1900, lost no time in staking out a number of claims for himself and the friends who had helped him get the all-important assays.

Such was the start of Tonopah, Nevada, one of the most spectacular of the high-grade camps of the West. In no time the town had taken on the appearance of a booming community; tents had sprung up everywhere, and from holes and outcrops was coming ore worth hundreds of dollars to the ton, even after a haul of a hundred and fifty miles to the nearest railroad. Within three months Jim Butler leased his first claim, and from then on the system of leases developed which to a lesser degree has continued to this day. The first year the leasers realized about four million dollars worth of ore, mainly in silver, from the Mizpah, the Desert Queen, and other claims.

The capitalists flocked in, and with them the other compliments of mining town booms, such as gamblers, barkeepers and others too numerous to mention. The story of Tonopah's development is a thrilling one, best told by C. B. Glasscock in his chronicle of Nevada's amazing boom towns, **Gold in Them Hills.** As is so often the case, the town flourished wildly, produced fabulous sums, and then suffered slightly by the location of other towns in the state. Although Goldfield, Rhyolite and Rawhide drew their quota of adventurers, Tonopah continued to flourish, with its own stock exchange, and all the attributes of a good sized town. But as it must to all high-grade towns, there came an end to the boom, and the ever-wandering mining men slipped away to the desert wastes on the search for better ore.

Up the long grade from Goldfield my poor car wheezed, not in the least aided by a torrid tail-wind. A split gasket had allowed the motor's compression to blow all the water out of the radiator, and so it was with several kinds of mental relief that I crossed the slight ridge and coasted into Tonopah. At first sight, the town looked much like any other, fair sized and rather permanent. Without its desert setting, it resembled many of the places in the Southwest through which my wan-

derings had led me. I wasted no time in leaving my car at a garage, and set out on foot to find someone who might get me into a mine. A friend in Beatty had given me some names, so away I went trusting to the luck which everywhere befriended me.

My wanderings through unmarked streets and backyards led me eventually to the home of one of the subleasers, to whom I introduced myself. A word or two might be in order at this point concerning the method of leasing employed at present in Tonopah. The owners of the mines lease them to men who in turn sublease them to pairs of miners. These select a portion of the mine to work, drill, blast, load and push their cars to the shaft, and the subleaser does the rest, supplying the power, the machinery, marketing the ore, and, most important, giving geological and engineering advice. It was just such a leaser whom I sought out.

Mr. Herman Budelmann is the subleaser for the Belmont group of claims, including the old Desert Queen staked by Jim Butler. He very kindly invited me to accompany him next morning on his tour of the mine, setting a time and place for our meeting. I returned joyfully to my room in a miner's rooming house to splash some of the more obvious dust off, and started out to inspect Tonopah. The town is situated in the hollow formed by the rock outcrops which are its excuse for being, and looks out over the long slope up which Butler and his burros came. Everything is either up or down, due to the hillsides half surrounding the town, but the grades are not steep. The bank and the hotel, in their cut stone finery, reflect the glory that was Tonopah's; they stand securely, overlooking the weathered wooden buildings which predominate along the main street.

There really isn't a great deal to Tonopah now. While I hesitate to place the population at two thousand, that figure can't be much of an error. The steel frames of numerous mills are a skeleton reminder of the greatness and prosperity which lingered for a time before it passed on to bless the other communities of the true west. I prefer to recall the more earthly signs of Tonopah's adventurous past, its mahogany and mirrored bars, with the scantily draped anatomical distortions gold-framed upon the walls, the memorable sound of good honest silver dollars, and the talk of mining men who, dissatisfied with their fifty dollar ore, longed for the old days once more.

Night in Tonopah is an experience for a city dwelling tenderfoot. The air is clean and cool, almost cold, after a hot day, the sky clear and filled with stars, closer and more of them than anywhere outside the desert and beyond the blue ranges. Half the population stands about the stores talking and smoking, loafing after a day of hard work. Little happens, but no one seems to care much one way or the other. The movies or a good dogfight are about the only entertainment beside the ever spinning roulette wheel and similar sports. I got tired of standing around doing nothing long before anyone else did, and returned to the porch of my rooming-house. There, feet on the rail and chair tilted precariously, I indulged in long conversation with an old-timer whose zeal in reminiscing was only exceeded by the enthusiasm with which he tried to interest me in a remarkable mine of his, merely in the claim condition at present, it was true, but soon, he assured me, to equal the best, with a little financing. This went on for hours.

Next morning bright and early I was sitting on a street corner, complete with hammer, collecting bag, papers, and my ever present helmet. Very soon Mr. Budelmann drove up, and loaded me into the car. I'm inclined to think he smiled when he saw me, ever so proud of that helmet, a hammer in my belt impeding every movement, and a very dirty laundry bag which must have given the impression I intended to collect the whole mine. Moreover the way I was dressed, by courtesy of Montgomery Roebuck Co., was in itself enough to terrify most shopkeepers whenever I strolled in, and it's no wonder hotels insisted that I pay when I registered. Despite all the camouflage, I was well received by the men grouped about the shaft, and amid much

laughter I was formally placed on the list of men working.

When all the miners had gone down, and after I had signed the usual waiver required on such occasions, Mr. Budelmann, the foreman and I stepped in the cage, the bar in front was let down, and as Mr. B. waved his arm, we started to drop. I held on for dear life and began to wonder about the proficiency of the man operating the hoist. My fears were in vain, for the cage came to a stop, and I saw in the yellow light a broad passage stretching away into the darkness. "The seven hundred", announced Mr. B. Out we stepped, and started off. After the first turn I was lost, but I had the best guides in the world, so I wasn't especially concerned. Where we went I'll never know, but we wandered around a good deal for my benefit. This was the first level where silver was found, the shaft having been sunk on faith and geology to intersect the important rhyolite flows. The veins were greyish in a white, hard, siliceous rock, and composed of argentite with the ruby silvers to a lesser degree.

After prowling about the seven hundred, we reached a winze which was little more than a narrow hole twisting and turning in the blackness. Mr. Budelmann went first down the ladders, and I followed, trying to look down without losing my helmet. With my hammer shifting about my middle, the bag flapping now in front and now in back, my maneuvers were anything but graceful. The carbide flame fromg my lamp persisted in toasting my hands as I crept down the ladders, and without a great deal of care I'd have started a conflagration before the hundred foot descent was over. As it was, every time the ladders were offset a few feet I persisted in continuing my descent straight down, to find myself treading on space. When I had begun to wonder just how far down a hundred feet went, we emerged itno the eight hundred, somewhat to my relief.

At this point I dumped my equipment, and feeling a little freer, skipped along trying to watch geology, minerals and my footing all at once. In places the floor of the passage was cluttered with rock from the chutes leading down from above. Elsewhere the floor was lacking, where tracks crossed an ore chute to the level be.ow. We crossed the area of Tonopah's greatest fault, where a thousand foot plus displacement had thrust up the ledge beside which some burros and a prospector sought shelter on that May day nearly four decades ago. In places the passage was seven or eight feet wide, but occasionally it widened out, showing where the ore had been particularly rich, or branched off into dead end workings. By various routes we returned to the point where we had left my equipment, and while I wrestled with it, Mr. Budelmann started down more ladders.

Once again we crept down through the depths, our little circle of light the only cheerful aspect of a descent which, judging by the increasing heat, was rapidly bringing us near the infernal regions. On the nine hundred we met many of the miners, and while Mr. B. gave freely of his advice concerning the probable trend of the richest ores, I stood out of the way and inspected the material being taken out. None of it was spectacular, and the light of carbide lamps gave too little illumination for me to determine the minerals present. Continuing our route, we came suddenly upon a chamber whose true dimensions I can only estimate. It was about thirty feet wide and more than twice as high. These large workings are scattered throughout the mine's lower levels, and formed some of the richest deposits. Only the nearest portions were clearly visible in the light of my lamp, but I could see clearly the square-sets which filled the entire chamber.

To those unfamiliar with square-sets as employed first in the Comstock Lode and thirty years later in Tonopah, a brief explanation may be in order. Wherever the walls and roof rise too far to allow the use of single props, support is given by the use of such timbering. Timbering in western America has been developed more and better than anywhere else, and Tonopah furnishes a good cross-section of timbering ingenuity and skill. Square-sets are especially adapted for the re-

moval of ore occurring in large bodies, since they can be enlarged with the operations. The set is formed of posts, cap, girt and sill, arranged in open cube formation, like the girders of a sky-scraper. The sill is the square of timbers at the base of each set, with a post at each corner standing straight up. A timber crossing the top of two posts at right angles to the trend of the chamber is the cap, while the girt runs normal to the cap, and along the length of the room.

The open framework of the square-sets crisscrossed all about us, and like steel-workers we walked out over the depths, hopped across the corners and climbed a bit to visit two men salvaging some of the ore left from the richer days. From there we returned to the level, where we examined a stope, or inclined chamber, resulting from the cleaning out of a dipping vein. The timbering of these openings looks simple enough, but the man who can install it correctly commands high wages. The method in use at Tonopah is the stull system, which employs three pieces, a timber for the headpiece, another for the foot, and a pole to cross the gap between the hanging and foot walls. Yellow pine logs without their bark are forced into place with the timbers at right angles, one on each end, against the walls.

Square-cut timbers are of pine, eighteen inches on the side, and are used for the square-sets, where stress is distributed. But cutting poles square weakens them, and so entire tree sections must be used for stulls. I mention these machanics only because they are so well demonstrated in the Tonopah mines. These mines were planned for the future, and therefore provision made for the stress which is inevitable. The chambers close up in a few hundred years, and already the irresistable force is plainly evident. Since the timbers are weaker then the stulls, they crush first and may be replaced, thus slowing up the eventual closing, and preventing effectively any sudden cave-ins. We saw stulls so tight that they rang when tapped, and eighteen inch head-pieces crushed to two inches in thickness, while their stulls were in perfect order. This seems incredible, yet one may better understand the true force of the stress when one sees beams strong enough to support anything imaginable, crushed from the ends until they are merely bundles of six-foot fibers looking for all the world like a giant broom.

One is impressed with the silence of mine depths, the warm moist air, and the lack of earthly signs. Below ground is another world, a world strong, dark and still, where one could die in a fraction of a second and never know it, where there are no living things save the men who are interested only in hacking a living from the rock. And yet the underground is friendly in Tonopah, with no cave-ins, and the greatest unpleasantness the hot, still air, which we soon encountered on our wanderings. A pair of miners had found a promising vein which wound upwards through the rock from the thousand foot level, where we found ourselves after a brief ride in the cage. To work the vein the men needed fresh air, since in any pocket above the general level the hot air collects. And so they were quickly tunneling upward to the nine hundred to establish a flow of fresh air, after which they intended to mine the ore which their hole followed.

Up eightly feet when we reached them, the men were working in the nearest thing to unbearable conditions which I have ever encountered. Speed was most essential, since no man could long endure the moist heat which filled the dead-end tunnel. The place was just big enough for a ladder, and at its more level points I could only rest crouched between the floor and roof as tightly as a stull. Added to the impediments was a six inch pipe from the blower which served to keep the hot air in motion, although it seemed little improvement, since a damp heat is the same still or in motion. Mr. Budelmann, who is a good six foot four and built accordingly, spent some time in the tunnel giving helpful advice, since it had to intersect a passage on the nine hundred, but I preferred to relax about half way down. The altitude of Tonopah is

more than six thousand feet, and thus one unaccustomed to the effects of the thinner air finds himself generating about half his usual horsepower.

After a trip into the Desert Queen, included in the Belmont group, and connected at every level, we visited a point where two miners had something which was definitely a good thing. Apparently overlooked in the high-grade days, was a soft vein of silver, which was being traced by a couple of enthusiastic men. They stopped their work long enough to get advice and show me the minerals which they apparently can smell out, for they are not easily identified in the ore. Argentite, proustite, and pyrargyrite all appear grey in the ore, and the ruby silvers only show their color in polished specimens. One would not suspect their presence except for the antimony stain of the latter and the rare occurrence of proustite in crystals. Native silver is obvious, and often untarnished, which I considered strange, due to the presence of the many sulphides.

Most interesting mineral at Tonopah is iodyrite, which the men were mining at our last stop. The element iodine is comparatively rare in the mineral kingdom, but at this district tons of it have been removed, much of it in crystals. The silver iodide is pale yellow in platy and rounded crystals which are practically invisible in the light of a carbide lamp. This fact would make mining and collecting a matter of chance if it weren't for a peculiarity of iodyrite. The men showed me their method, which is most efficient. They hold a lamp over the rock wall, and any iodyrite present glows reddish when heated, and if continued, the test produces a button of silver. With time at my disposal, I could have gathered pounds of iodyrite from that spot, although most of it was in minute crystals on the siliceous rock. As it was I contented myself with a few specimens, since I was actually being given the material by men who spent their days underground to make a living. They are certainly entitled to all they can get, and I have the greatest admiration for miners who, after all, love the sun and air as well as the rest of us, and probably more.

By about this time I had gotten used to the set of my helmet; it no longer seemed to pull my head down, and I could more or less skillfully navigate without fear of losing it at every step. And so it was that I felt a bit reluctant at leaving the mine, for those were a memorable four hours that I had spent underground. We hiked out to the shaft, set the bar down on the cage, and at a signal from Mr. Budelmann we were whisked up into the world of light, I chuckling the while at the look on the foreman's face a short time before. We had been crawling through a hole like three Indians, the foreman in the center, when suddenly the van of the procession stopped, and I, off in a cloud of thought, kept on. The long flame of my poorly adjusted lamp came in contact with the nearest object, which happened to be a broad expanse of trouser. The foreman mumbled something very much to the point, and peered around reproachfully.

With a sudden slowing and a burst of light we reached the surface, and stepped out, blinking like a row of owls. I thanked the foreman cordially, and with Mr. Budelmann drove down to Tonopah, where my kind host and guide left me with an invitation to visit the office later, a matter which I promised to attend to. I ransomed the car and, after a lunch over my pet bar, with the pink creatures innocently relaxing in their guilded frames, I set out for Manhattan, Nevada, and further adventures.

PRECIOUS QUARTZ

By NICHOLAS A. D'ARCY, JR.
Vice-President Los Angeles Gemological Society

One of the virtues ascribed to all precious stones is rarity, yet quartz forms over twelve per-cent of the earth's crust and next to feldspar is the most abundant mineral. From earliest times quartz has supplied some of the most valued gems ranking in value with the diamond and the emerald.

Quartz gem deposits are spread over the entire length and width of the United States. Oregon and Washington beaches and streams are the source of many fine agates. Wyoming and Montana blend manganese dendrites with their agate and produce beautiful moss and landscape agates. The Great Lakes, Mississippi River and many smaller rivers provide agate collecting localities for mineral collectors. Rose quartz deposits in South Dakota are among the largest in the world but Maine, New York, and the Sierra Nevada mountains above Sequoia National Park, California also produce fine specimens. Amethyst is found in Arizona and many fine gems have been cut from the material. Crystal quartz has been produced in abundance and many Herkimer (N. Y.) "diamonds" and Hot Springs (Ark.) crystals are sold every year. Virgin Valley, Nevada has produced fine precious opals and beautiful specimens of precious opal in petrified wood, some pieces being completely opalized.

TRANSPARENT GEMS

The early popularity of quartz has not been lost and fine quartz gems are valued treasures of many crown collections. Surmounting the great Star of Africa, a 516 carat portion of the Cullinan diamond in the Royal Scepter of the King of England, is a beautiful amethyst. The King's Orb and the Prince of Wales coronet also contain fine amethyst. One of Queen Charlotte's most valued possessions was a beautifully matched amethyst necklace valued at $10,000.

England is not the only, nor by far the first, to include quartz in the Crown Jewels. The French Crown collection included two exquisite amethyst vases, one shell shaped and the other fluted and engraved, both being over seven inches tall. Cleopatra prized an amethyst signet ring engraved with the figure of Maenad, the genius of intoxication. Although amethyst was a very common stone in signets and seals it was unusual to have the figure of Maenad engraved upon this stone.

Most of the engraved amethyst recovered from ancient times are executed on very pale stones, indicating that the deep purple was valued too highly to allow the engravers to mar the surface. A notable exception is a beautiful deep colored amethyst found about two hundred years ago bearing the head of an ancient Bactrian king. This is one of the most perfect pieces of portrait engraving on any existing stone and it is thought that it served as the royal seal. None but the most valued stone would be suitable for this trust.

Amethyst was also used as the standard by which royal purple dyes were measured. Less valuable pieces were made into goblets, the old belief being that amethyst would protect the imbider from drunkness and therefore wine taken from an amethyst goblet would not be intoxicating.

With the discovery of amethyst in Brazil and Africa the value dropped from approximately that of diamond to a few dollars a carat. Now fine deep purple amethysts are within the reach of all.

Pliny realized that amethyst and rock crystal were the same mineral and ring stones fashioned from quartz crystal were known as clear amethyst. While quartz was not held in great esteem as a gem stone by the ancients it was most valued when carved into drinking cups

and vases. Nero prized his quartz basins and goblets. When informed that the Roman Senate had voted his death, Nero smashed two deep crystal basins engraved with designs from Homer to prevent anyone else from drinking from them. Emperor Augustus is reported saving the life of a boy condemned to death, by his master Vedius Pollio, for accidentally breaking a crystal vase. One common belief about crystal cups was that they should be used only for cold drinks. Agate bowls were used for hot drinks.

Crystal balls were also highly valued in the early days. The medical men believed that no better cautery could be used on the human body than the sun's rays focused through a crystal ball. Orpheus recommends the crystal ball as the most proper instrument for kindling the sacrificial fire. A fire so kindled was dedicated to Vesta, the guardian over household life and the hearth fire.

Today rock crystal beads and ear rings form an important part of mi-lady's gem collection. They will go with any color and are suitable for almost any occasion. Polished sections of quartz, of the highest quality, are the very heart of modern broadcasting stations regulating their frequency. Quartz lenses meet the high standards of modern science and retain their polish far longer than similar glass lenses. As a precious stone clear quartz has fallen from the heights but as an aid to the modern Maji quartz is still a precious stone.

Citrine quartz is one of the most popular of modern stones. It is used in most November birthstone jewelry and the precious topaz it replaces is a great rarity. This gem does not have the life nor hardness of precious topaz but it is plentiful and fills a need. Citrine is often sold as false topaz, quartz topaz, occidental topaz and sometimes by unethical jewelers as topaz which detracts from the value of precious topaz and discredits the value and beauty of citrine quartz. Natural topaz colored quartz is very rare and most cut stones on the market are heat treated amethyst or smoky quartz. Both amethyst and smoky quartz lose their color when heated and this allows the manufacturing jeweler or lapidary to match the colors of various stones when many stones are required in a set.

Rose quartz forms some of the most beautiful quartz gems, it being fashioned into beads, pins, ear-rings and settings for rings. Asteriated rose quartz is the basis of the new popular imitation star sapphire known as star-o-lite. This material is cut into cabachon stones with the star properly oriented and, even without the blue or red backing used to intensify the color, forms a very attractive gem. Star-o-lite is now set in white gold and sometimes surrounded by diamonds and has been displayed with rubies, emeralds and diamonds by at least one leading jeweler. Less perfect pieces of rose quartz are fashioned into vases, bowls, lamps and carved art objects and some of the material is used for ornamental building stone. South Dakota has what is perhaps the largest and best deposit of rose quartz in the world and Scott's Rose Quartz mine is a leading producer.

Glassy green quartz spangled with golden flakes of mica or reddish hematite produces the gem aventurine quartz. This is rarely found in nature in good quality with even distribution of color and spangles and has been imitated with green glass containing copper filings. This is one gem which is more perfect when manufactured by man than by nature but fine quality aventurine forms very interesting gems and is held in high esteem by the Chinese.

California gave the world a new gem when clear crystals of quartz were unearthed containing leafs and stringers of native gold. During the early gold mining days in California, gold quartz jewelry was in great demand. These fine clear crystals with their contrasting gold formed stick pins and watch fobs for many a hard rock miner while ear rings and finger rings of similar material were as dear to the belles of the camps.

Venus's hair-stone is another interesting quartz gem in which enclosures of

rutile add color and design. This gem is often cut heart shaped and the needles of rutile are often referred to as cupid's arrows.

Smoky quartz is sometimes cut into gems but more often it is heated to lessen the color and produce citrine quartz.

PHENOMENAL GEMS

Lucky opal has retained its value from early time. This colorless jell of quartz and water contains all the color known in gems. It is the only non-crystalline gem stone of great value and it alone of the fine gem stones is not found in the home of gems—the orient. The Romans valued opal next to emerald and justly so. Their meager lapidary equipment was ample to cut cabachon opals and in this way obtain their maximum beauty, a feat they could not achieve with faceted stones. Ancient lore prescribed the opal as the most potent talisman as it had the protective virtues of all the stones whose colors it displayed. Mark Anthony so desired the opal of Nonius as a gift to Cleopatra that he had Nonius banished to exile. Rather than surrender this beautiful opal, reported to be as large as a hazel nut, Nonius fled to safety leaving all behind but his opal ring. This ring has been valued at $100,000. Empress Josephine Bonaparte possessed one of the finest of modern opals called "The Burning of Troy" because of its great fire. A large opal in the Imperial Cabinet in Vienna, Austria, is valued at over $250,000 and the Turks place opal and diamond in the same class.

It remained for Sir Walter Scott to pick this beautiful and mystic stone to adorn Lady Hermione in his novel "Anne of Geierstein." No stone could better portray her character than this enchanted stone which is colorless yet flashes all the colors. A single story of this nature, condemning one of the most beautiful and unusual gems as unlucky, is the basis of a modern superstition unparalleled.

So valued was the opal that ancient glass makers did what modern science could not do—imitated the opal. Pliny relates that these manufactured opals were so perfect that they fooled the experts. The surest test was to hold an unmounted stone up to the light, if it retained its color it was genuine, if the color was lost thru transmitted light the owner had an imitation.

Opal was not the only quartz stone tampered with by the ancients for Pliny tells of stained crystals as "Treatises were extant directing how to stain crystals so as to pass for the emerald and other precious stones" but declines to point them out "as even luxury should be protected from fraud" adding that no other mode of cheating was so lucrative as tampering with precious stones.

Dutens had no such scruples and was willing to publish the following methods. Crystals should be repeatedly heated red hot and plunged into tincture of cochineal to produce the ruby, tincture of saffron to produce topaz, tincture of turnsole to produce sapphire, tincture of turnsole and saffron to produce emerald and juice of herprun to produce amethyst. The modern method of cutting the stone to shape and painting the back the required color was probably used.

Other phenomenal quartz stones include star rose quartz, cat's eye, tiger's eye and iris quartz. Cat's eye is a greenish quartz with fibers of asbestos running thru it in parallel bands. In cabachon cut stones the light is reflected from these fibers in a regular line to form the light colored, movable streak of the eye. Tiger's eye is cut from crocidolite asbestos that has been replaced by brown silica. Either cat's eye or tiger's eye may be stained blue to form hawk's eye and some report natural blue hawk's eye. When quartz crystals are fractured internally the light is broken up into its component colors and will give flashes of rainbow color when it again escapes from the crystal or gem. This is iris quartz.

TRANSLUCENT GEMS

The crytocrystalline translucent quartz gems are all included under the general classification of chalcedony and contain some interesting gems.

Chrysoprase is a beautiful fine grained apple green quartz that has been stained by nickel oxide. This gem is rarely found of an even desirable color in nature but it can be stained after cutting with a nickel salt. It is almost impossible to tell the stained from the natural stone and the altered stone has the advantage of not fading with exposure to light and heat. The natural well colored chrysoprase is both rare and precious and is in great favor in China where it is sometimes called Imperial Yu stone.

Bloodstone is surrounded by numerous religious legends and many think it originated from drops of blood of Christ falling on green chalcedony at the foot of the Cross. Of course there is no truth in this interesting belief as bloodstone seals have existed from Babylonian times. A beautiful bloodstone bust of Christ is in the French Royal Collection which was executed to make the spots of red resemble drops of blood. The gem bloodstone is rarely seen as it is an almost transparent green chalcedony flecked with spots of red jasper. The common stone in birth stone jewelry is opaque and sometimes almost black. Bloodstone has been considered a natal stone for March by almost all races and is listed as one of the stones in the high priest's breast plate of biblical times.

When chalcedony forms in even alternate layers of black and white we have the gem onyx. This stone was used by the cameo and intaglio engravers as the alternate layers allowed them to bring their figures into strong contrast. Onyx today sets off many diamond rings and pendants forming a jet black background for the brilliant diamond.

Sardonyx (red-onyx) deserves mention as another quartz birth stone. It has served various races in July, August and September but is now accepted as the August stone. This stone is a reddish brown and white banded chalcedony and is interesting chiefly as a material from which cameos can be cut. Probably the most famous sardonyx gem was the cameo of Queen Elizabeth given to the Earl of Essex as a pledge of her friendship. Had it not been for a careless messenger delivering this ring to an enemy of the Earl's he would have probably been saved from execution.

Carnelian is a clear even colored gem which at one time only included the red and reddish brown colored chalcedony but now includes many shades and colors. The clear red carnelian is now called sard. All stones in this group have been used extensively for seals, earrings, brooches and large ornaments.

OPAQUE QUARTZ

The opaque quartz gems are all classed as jaspers and this group includes all the colors of the rainbow. Polished sections from the petrified trees near Holbrook, Arizona are noted for their color and design and many interesting gems are cut from them. They are also made into book ends, ink stands, ash trays and other art objects. Petrified palm from near Randsburg, California produces an interesting design when cut cabachon as it retains perfectly the fine texture and grain of the palm.

Jasper is widely found and an interesting deposit, having a green background, was found under the sea at the Golden Gate, San Francisco, Calif., while excavating for the new Golden Gate bridge. It is perhaps the only gem stone that was mined by modern deep sea divers and high explosives. Red orbicular jasper is found in abundance near the California-Oregon line and forms a very interesting polished specimen.

Arizona has produced spectacular cabachon stones of jasper stained with azurite and malachite which has the beauty of the copper ores and greater hardness which insures better polish and longer life. Jasper stained with cinnabar from the Mojave desert, California produces interesting brilliant red mottled stones. In fact jasper is one

gem stone that is almost universally distributed and has a large sale in jewelry.

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SOMETHING NEW IN FLUORESCENCE

It is our policy not to make advance announcements regarding articles to appear in future issues of **Rocks and Minerals.** So great is our enthusiasm in reference to a unique contribution now in our hands that we urge our readers to prepare for a genuine surprise in the February issue.

A specially prepared article on Fluorescence by Henry Moeller, Research Director of Vio-Fluor Products Company, Newtonville, Mass., which will appear on four pages in our next issue, will be printed with a new ingredient which will fluoresce in a striking manner when activated by ultra-violet rays. The article itself provides new thoughts on fluorescence which will appeal to mineral collectors.

In this connection Vic-Fluor Products Company has placed at our disposal, exclusively for our readers, a limited number of their ultra-violet lamps at less than cost. Color reactions are different under this source than either cold quartz or argon. To those ordering at once the price is $15.00 in advance, F.O.B. Newtonville, Mass. All orders must be sent to **Rocks and Minerals** in order to obtain this reduced price. We have investigated this new ultra-violet lamp and we can heartily endorse it. The same lamp has been used for various commercial purposes as for detecting dope treated wrappers and twine, secret writing, altered documents, revenue stamps, and other negotiable materials.

ROCKS and MINERALS

PEEKSKILL **NEW YORK**

THE PROSPECTOR

By Former Governor WM. SULZER, of New York

The prospector is the most useful man to commerce and the most valuable man to civilization. No prospectors, no mines. No mines, no civilization.

Political economists tell us that mining, next to agriculture, is the greatest industry.

This is true from the viewpoint, that if our soil were untilled famine would stalk the land.

From a monetary standpoint, however, the mining industry is the greatest in the world. The truth of this assertion becomes apparent when it is visualized that mining gives us the standard of value by which the price of everything produced by the brain and brawn of man is measured.

Abandon mining and the value of every commodity would be insignificant, humanity would sink back to the barter and exchange age, and financial paralysis would lock in its viselike grasp the industries of mankind. It would be the greatest calamity that ever befell the human race, and in less than a century civilization would revert to barbarism, when primitive man knew nothing about copper, gold, silver, iron, lead, zinc, and the mineral resources of Mother Earth.

Those who decry mining are ignorant of history. If they know anything about metals they must know that all business; that all industry; and that all human progress depends on the mines.

The wealth from the mines from the dawn of time is the epic of human advancement—of man's heroic march along the paths of progress.

Show me a people without mines, and I will show you a people deep in the mire of poverty and a thousand years behind the procession of civilization. It was the mines that made the greatness of the past; that made the ancient civilizations; that made Egypt great; that made Greece great; that made Rome great; and in modern times the mines have made Spain, England, and the United States rich beyond the dreams of avarice.

Mining is essential to the progress of civilization. Mining has done more for the human race than all other agencies combined. Mining has made more poor men millionaires than all other things put together.

More real profit has been made by investors in mining securities during the past century than in any other industry.

Strike down the miner; shackle mining; throttle the mining industry, and civilization will sink back to poverty and stagnation.

The greatest benefactor of the human race has been the prospector. The most beneficent men of all time are the far seeing men whose brain and brawn developed the earth's natural resources—the men who poured the golden streams of mineral wealth into the lap of civilization; into the channels of trade; into the avenues of commerce; and into the homes of happiness.

All honor to the miner! All hail the prospector!

Wm. P. Pitts, member from Sunnyvale, Calif., has sent **Rocks and Minerals** a glass plaque on which are mounted 20 minutely thin sections of chiastolites from Madera Co., Calif. The glass plaque is diamond-shaped, 6x4 inches in sizes, and stands upright on a small wooden base.

The chiastolites are all different—in size, shape and markings—and make a most pleasing 'picture'. We are grateful to Mr. Pitts for this very nice gift.

MEMBERSHIP DRIVE IN 1938

By PETER ZODAC

Secretary Rocks and Minerals Association

With this issue of **Rocks and Minerals,** we shall begin a drive to increase the membership of the Rocks and Minerals Association of which every subscriber to the magazine is a member. Organized in the early days of 1928, the Association has progressed steadily until now it is the world's largest mineralogical society with members on every continent. The Association can lay claim to many achievements in the mineralogical field such as organization of clubs, national outings that are held yearly, expeditions to many parts of the world as Russia, Norway, Spitzbergen, Germany, Austria, Czechoslovakia, Dominican Republic, Canada, Alaska and all over the United States.

We have given the Association so little publicity that most of our members have no idea of its tremendous importance—in which each and everyone of them through their membership have played an important part. If the Association with its little publicity could have accomplished much, with much publicity it can accomplish more.

We hope and trust that each and everyone of our members will try to secure at least one new member during 1938. Let us all work together in our drive so that by Jan. 1939, we can at least double our membership.

Geographical Distribution of Members of The Rocks and Minerals Association

Dec. 1st, 1937.

Alabama	7
Arizona	21
Arkansas	11
California	237
Colorado	98
Connecticut	101
Delaware	1
Florida	7
Georgia	23
Idaho	31
Illinois	113
Indiana	49
Iowa	31
Kansas	15
Kentucky	6
Louisiana	4
Maine	71
Maryland	31
Massachusetts	116
Michigan	80
Minnesota	41
Mississippi	3
Missouri	27
Montana	47
Nebraska	30
Nevada	37
New Hampshire	26
New Jersey	161
New Mexico	17
New York	321
North Carolina	24
North Dakota	14
Ohio	66
Oklahoma	14
Oregon	13
Pennsylvania	210
Rhode Island	40
South Carolina	2
South Dakota	30
Tennessee	9
Texas	30
Utah	20
Vermont	17
Virginia	14
Washington	70
West Virginia	10
Wisconsin	54
Wyoming	20
District of Columbia	30
	2,450

U. S. Territories

Alaska	8
Canal Zone	1
Hawaii	3
Philippines	6
Puerto Rico	1
	19

North America

Canada	31
Mexico	1
	32

South America

British Guiana	2
	2

Europe

Austria	1
England	10
France	1
Germany	2
Italy	4
Jugoslavia	1
Russia	6
Scotland	1
Spain	1
Wales	1
	28

Asia

China	1
India	4
Japan	1
Siam	1
Siberia	1
	8

Africa

South Africa	8
	8

Oceania

Australia	2
New Zealand	1
Java	1
	4

Miscellaneous Islands

Bermuda	1
Cuba	1
Dominican Republic	1
Martinique	1
	4

United States	2,450
U. S. Territories	19
Foreign	86
Paid up	2,555
In Arrears	2,671
Total	5,226

Financial Report

During the early days of **Rocks and Minerals,** when the magazine was issued quarterly, many of our members had made financial contributions to have the magazine come out monthly.

During the trying days of 1933-34, when banks failed all over the country and money was very scarce, it was the amount donated by members plus a grant of $500 made by the Carnegie Corporation of New York in the fall of 1934 which kept **Rocks and Minerals** afloat in the financial crisis.

In the summer of 1936, when we were planning for our 10th Anniversary Number (Special Agate Number), our members again came to the assistance of **Rocks and Minerals** with contributions amounting to $124.50. Since that time $17.45 additional has been received which was applied to the cost of membership cards, certificates and folders.

Statement of Receipts and Disbursements

Receipts

Monthly Fund	$506.10
Carnegie Grant	500.00
10th Anniversary contributions	124.50
Association Contributions	17.45
	$1,148.05

Disbursements

Support of magazine during depression	$1,006.10
10th Anniversary Number	124.50
Membership Cards, Certificates and folders	15.00
Cash on hand	2.45
	$1,148.05

THE NEW YORK MINERALOGICAL CLUB FALL OUTING

By LEO NEAL YEDLIN

The fall outing of the New York Mineralogical Club was held on Sunday, November 7th, 1937 at the Strickland Quarry, Portland, Connecticut. The trip was made by train and specially chartered bus, and with ideal weather some 18 members "reported for duty" at 7:45 A.M. at the scheduled place.

Within three hours the towers and canyons of Manhattan were left behind and the first hill after leaving Portland disclosed a far flung vista of the fertile Connecticut valley, with the winding, sinuous Connecticut River adding a silver ribbon of beauty.

The Strickland Quarry, atop Collins Hill,* some three miles outside the town of Portland, is in active operation at present. No time was lost by the prospectors in surrounding the waste piles and removing all things of interest.

The first find of the day was a mound of green crystalline beryl, typical of the material found here. From then on things came thick and fast. Following is a complete list of the minerals obtained during the day:

1. **Albite**
   - A. Cleavelandite crystals
   - B. Massive
   - C. Secondary and tertiary albite
2. **Apatite**
   - A. Crystallized green
   - B. Mangan-apatite
3. **Beryl**
   - A. Green crystallized
   - B. Golden, crystalline
   - C. Pink (1 specimen)
4. **Bertrandite**, small tabular clear crystals in Vugs in cleavelandite (4 specimens)
5. **Biotite**
6. **Calcite**
7. **Columbite**
8. **Cookeite**
9. **Fluorite**
   - A. Purple (cube and dodecahedron)
   - B. Transparent (cube)
10. **Garnet**
    - A. Almandite, small gemmy crystals
    - B. Almandite, flattened transparent crystals in muscovite
    - C. Large crystalline masses
11. **Lepidolite** (lavender)
    - A. Granular
    - B. Crystal plates
    - C. Zonal growths on muscovite
12. **Limonite**, preudomorphic after pyrite (in Vugs with cookeite, etc.)
13. **Lithiophilite**, massive
14. **Microcline Crystals**
15. **Muscovite**
    - A. Large greenish plates with crystal outline
    - B. Clear, with lepidolite borders.
    - C. Enclosing flattened garnets
16. **Opal**, var. Hyalite, (?) in greenish crust on Albite
17. **Perthite** cleavages, alternating fine veins of albite and microcline.
18. **Pinite** (serpentine after spodumene)
19. **Pyrite**, bright striated cubes in vugs.
20. **Quartz**
    - A. Massive
    - B. Small crystals in vugs in albite
21. **Sericite** (altered muscovite)
22. **Spodumene**
    - A. See pinite
    - B. Pink crystal parts
23. **Sphalerite**, small masses in granite.
24. **Tourmaline**
    - A. Black crystals in mica schist and granite
    - B. Green crystals in mica schist and granite
    - C. Pink and green crystals (watermelon tourmaline) with albite and lepidolite

*See **Rocks & Minerals**, May, 1937, for full description of the Strickland Quarry and its minerals.

A short time after the arrival of the main party, several other members arrived, having come by automobile. Little time was spent in greetings. The rock piles were too inviting.

Several exploring trips took place, and disclosed the fact that the region exhibited outcrops of the typical granite rock. Some were rounded and smoothed by glacial action, and glacial grooves were everywhere evident. Two-directional joints were noted, and a peculiar botanic situation presented itself. All the joints had vegetation growing therein. But very peculiar:—the north and south crevices had growths of grass and the east and west had fair-sized huckleberry bushes. Truly a problem for the Botano-Geologist.

The party left the quarry at five, with hearty appetites and heavy bags. The remaining minutes to traintime were spent in a tavern at Meriden. Here sustenance and wassail were procured, specimens shown and stories told, and the conclusion arrived at that a most successful trip had taken place.

The thanks of the club are due and hereby acknowledged to the operators of the quarry, and to Mr. S. A. Montague, who kindly provided facilities. Also to the Connecticut Company and Mr. W. N. Burke, treasurer, who arranged direct transportation from the train at Meridan to the quarry.

New York Club Incorporates

The New York Mineralogical Club, founded in 1886, has been incorporated under the membership corporation laws of the State of New York, and shall henceforth be known as the NEW YORK MINERALOGICAL CLUB, INC.

At a special meeting held on November 5th, 1937, a Board of Directors were elected, comprising the fallowing members:

Dr. Bertram T. Butler
Dr. Olak Andersen
Harry R. Lee
Dr. Frederick H. Pough
James A. Taylor
Gilman S. Stanton
Leo Neal Yedlin

The officers remain as follows:
PRESIDENT, Dr. Berthram T. Butler
1st VICE-PRESIDENT, Dr. Olaf Andersen
2nd VICE-PRESIDENT, Harry R. Lee
SECRETARY, Dr. Frederick H. Pough
TREASURER, James A. Taylor.

A constitutional committee formulated and devised a new constitution for the club, the provisions complying with the New York State Membership Corporation Laws, and embodying those terms, purposes and regulations which have been the governing factors of the club since its inception, fifty-one years ago.

—LEO NEAL YEDLIN.

25 Minerals Offered In Contest—"How Can We Increase The Membership of the Rocks and Minerals Association?"

Now that winter is with us so that mineral trips in many parts of the country are shelved until spring, we must confine our mineralogical activities indoors. In order to help pass away the time, we shall conduct a brief contest which is opened to all readers of **Rocks and Minerals.**

RULES: Write a letter of 200 or 300 words in answer to this question—HOW CAN WE INCREASE THE MEMBERSHIP OF THE ROCKS AND MINERALS ASSOCIATION? Send all letters to Contest Editor, Rocks and Minerals, Box 29, Peekskill, N. Y., not later than Feb. 5th, 1938.

A prize of 25 minerals, donated by John Grieger of 405 Ninita Parkway, Pasadena, Calif., will be given to the winner.

SOME INTERESTING OBSERVANCES

By WILBUR J. ELWELL

I am planning a mineralogical trip through 17 states covering a distance of 6,000 miles—to be gone a month. This trip seems very small when compared with one made by one collector with whom I am acquainted. He told me about having been to every country in South America, to most countries in Europe where he visited all the important museums, and six times across the United States. I asked him what was the most wonderful specimen he ever saw and he replied that it was the gem rhodonite tomb in Russia. It was 7 feet long, 4 feet wide and had been cut out of a block of clear rhodonite.

At Ekaterinburg, Siberia, (in the Urals), the collector further told me, there are streets paved with semi-precious stones—beryl, tourmaline, and others. The crown jewels in the Tower of London also fascinated him. The huge copper mines in South America which are worked by hand labor (cheaper than by machinery) impressed him greatly. The Chivor emerald mines near Somondoco, Colombia, where the emeralds are mined by cutting steps in the mountains and the materials washed down with water, likewise interested him. Five mines are worked by the company who operates the Chivor mine and the largest emerald taken out in recent years weighed 630 carats and it was of good color. Among other interesting facts told me by the collector was of a big silver mine in South America which employs 10,000 men; the company controls land 200 miles square; the rock crystal ornaments in the chandelier in the chateau at Fontainbleau, France; the yellow topaz from Ouro Preto, Minas Geraes, Brazil; the large franklinite crystals in the Canfield collection; and the black diamond and large topaz crystals in the Washington Roebling collection. (I have several pen and ink letters which I received from Mr. Roebling when he was among the living; these I value very highly).

Just think how many mines, quarries, and localities there are in the United States alone. Take California for instance. If you visit two a day you would not see them all in a lifetime. So we plan small trips near home and read about famous ones, far away, in **Rocks and Minerals.**

About 1½ miles southwest of Southford, Conn., is a quarry 100 feet long, 100 feet wide and 40 feet deep—now filled with water. Masses of quartz 25 feet wide were found here and the quarry was worked by the Bridgeport Woodfinishing Co., the quartz was used as a wood filler. I still think this quarry could be worked at a profit for beryl, mica, feldspar and quartz. The quartz is a pale milky rose, translucent variety. Torbernite, small garnet crystals and galena were also found. Bismuthinite, as yellow coatings on quartz; native bismuth, often in large pieces—one sold for $75—were other minerals that have been found. I once saw a large quartz crystal from here—a perfect specimen—10 x 6 inches, which must have come out of a vug. The dump is now very small so that one would have much trouble in finding specimens without doing a lot of digging. The quarry was last worked in 1910 when it employed 10 men.

The garnet locality near Roxbury Falls, Conn., consists of three open pits on a high hill. This place has been overgrown with bushes but recently the owner cut them down and is now charging collectors and others 25c to go on the dumps. Some of the material of the dumps has been used for top dressing on old back roads in that section; one day I picked up 2,000 garnets off such roads. In the pits, the garnet is imbedded in a silvery mica schist.

There is another pit near Roxbury Center, Conn., which has been visited but by few collectors. To reach it, go west of the Center a short distance, then south a mile on an old wood road—you will have to walk as it is not good for a car. The garnet from this pit was carted to Roxbury Station years ago for shipping to Boston, Mass., for use as an abrasive in the shoe industry.

There is another garnet locality on Sunset Hill, Redding, Conn., which is now exhausted. Some extra nice garnets have been found in Redding Glen, in the Curtis mine,—now on private land—no trespassing. An essonite garnet locality is south of the Redding R.R. station, along the road near the R.R. tracks. Some fine crystals and groups of crystals occur in the massive essonite. A few manganese garnets, in groups, came out of the Branchville, Conn., feldspar quarry. I have a nice group in my collection.

All of the above quarries in Connecticut are no longer in operation.

Detach here or nominate by letter if you do not wish to mar this page.

MEMBERSHIP NOMINATION BLANK

ANNUAL DUES
$2.00 A YEAR

..... 19....

Secretary, Rocks and Minerals Association,
Box 29, Peekskill, N. Y., U.S.A.

I nominate for membership in the Rocks and Minerals Association and to receive **Rocks and Minerals Magazine:**

(1) Name .....

Address .....

(2) Name .....

Address .....

(3) Name .....

Address .....

Name and address of .....

nominating member .....

(PLEASE PRINT OR WRITE PLAINLY)

See inside of first cover for Association purposes and privileges.

THE AMATEUR LAPIDARY

Conducted by ARTHUR KNAPP
1401 Arch St., Philadephia, Pa.

Amateur and professional lapidaries are cordially invited to submit contributions and so make this department of interest to all

WHAT TO EXPECT WHEN GRINDING AND POLISHING MINERALS

Edited By H. L. PERDIUE

Little has been published on the various characteristics of stones from the standpoint of working them. In this article, I want to point out what you may expect when you attempt to cut and polish certain minerals. Naturally in a short article I cannot cover all minerals, but can tell you of some of the surprises you will meet. There is no way of stating the ease or difficulty with which various minerals may be worked. This must be learned mainly from experience. The main thing to remember is that the one who is attempting to slice, grind or polish a speciman must be patient, and expect to be astonished at how different are the working characteristics of various minerals.

All minerals have three characteristics: Hardness, Toughness and Brittleness. We have heard much about hardness. Mohs scales of hardness is the one generally used. The Greek or Pythagorian scale is generally a more accurate omparison of hardness than is the Moh scale. The following table gives these two scales.

Mineral	Moh.	Greek
Talc	1	1
Gypsum	2	2
Calcite	3	3
Fluorite	4	4
Apatite	5	17
Feldspar	6	36
Quartz	7	120
Topaz	8	175
Corundum	9	1000
Diamond	10	14000

From these scales you can see from a comparative standpoint that quartz is 120 times as hard as talc or Corundum is about 30 times as hard as Feldspar. From an abrasion or scratch standpoint, it has also been found that this comparison holds true.

TOUGHNESS is a characteristic found in certain minerals and it is not confined to any particular class. It may be called tenacity or the ability of the new particles of a mineral to hold together. It is caused by the natural interlocking of the grain structure so arranged as to make these minute particles difficult to separate.

BRITTLENESS is almost the direct opposite of toughness. If a mineral is brittle the particles separate easily. You have experienced brittleness in trying to break off a piece of stone only to find that a large portion of it shatters. Degree of brittleness is not easy to determine.

All minerals may have one or more of these three characteristics. In splicing and grinding you will soon learn that the hard minerals may take a long time to work, but a hard and tough mineral takes much longer and is much more difficult.

Take Dumortierite for instance. This

(Editor's Note: This is the third of a series of articles written by John Vlismas, Professional Stone Craftsman, of 244 E. 77th Street, New York City).

mineral has a hardness of approximately 30 in the brief scale, which is considerably less hard than agate, yet it is much more difficult to slice, grind or polish. Its particles are much more difficult to tear apart or smooth down due to the interlocking toughness of its grain. Most amateurs have cut agate and know that even tho it is hard it can be worked to a smooth glossy surface. Dumortierite is one of the toughest minerals to fabricate.

In the case of Lapis Lazuli with a hardness somewhat greater than Dumortierite you will find the mineral slices and grinds fairly easily, but when you come to polish it the results will take considerably longer.

Jade with a hardness of around 70 in the Greek scale requires a long time to slice and grind, but when it comes to polishing it is fairly easy. This mineral has more or less natural greasy characteristic and with the right kind of polishing compound good results are easily obtained.

As pointed out above, similar characteristics are not confined to any particular family or group of minerals. In the quartz family,hardness and toughness both vary to a certain extent. This will be confirmed by those who have worked agate and rock crystal. Agate is really more difficult to slice than rock crystal, but when it comes to polishing rock crystal you have real task to remove all scratches and get a perfect polished surface. Agate on the other hand is much easier to polish.

From this discussion you can see that it would be most desirable to have a quantity of different grades of cut-off and grinding wheels for the different types of mineral to get the quickest results. I use 8 or 10 different sizes and grades with my regular work. It is impractical for an amateur to have so many. The two grades mentioned in my previous article are the best that can be obtained for all around work.

Altho it will take a little longer for some minerals the time element is not so important for amateurs. Only recently I demonstrated my cut-off wheel for hard stone, to two amateurs. At that time I showed that a square-inch of Labradorite could be sliced in 17 seconds. A square inch of agate can be cut in about 4 minutes. This no doubt is much faster than most amateurs are able to cut today.

At this point I want to again explain that for the best results you should use the following suggestions.

1. Keep your cut-off or grinding wheel tight on the spindle.
2. Use either a steel or diamond dresser on the wheels more often to keep them running true.
3. Keep your belt tight.
4. Hold the work firmly.
5. Use plenty of water.
6. Keep bearings of machine well greased.
7. Be careful no grit gets into the bearing.
8. Keep your mind on your work.
9. Do not run the grinding wheels faster than 1750 rpm. When polishing or making spheres speed should be 900r.p.m. or less.
10. Remove sharp edges from the lap wheel and sphere adaptor in order not to cut your fingers.

As a suggestion you can resharpen your grinding wheel by placing a quantity of No. 12 carborundum on a flat marble slab and rotating the rough side of the wheel back and forth over the surface. This will soon level out the wheel and bring it back to an even surface.

Polishing results are dependent largely upon the polishing methods and materials used. Wood, leather, or felt wheels may be used to carry the polishing medium. I have found that a hard felt wheel of good quality is the most satisfactory all purpose wheel for the following reasons. Either the top or edge of the wheel may be used. The felt holds the abrasives and absorbs water. It holds it safe when dried out.

In my previous article I recommended Kio polishing compound as the best obtainable. This is true for the vast maiority of minerals. I developed this compound after numerous experiments. Kio consists of certain oxides and acids in

proper proportions. When used it does two things. First the oxide acts as a very fine polishing abrasive to smooth out the material. Secondly the acid dissolves the surface and eliminates the pores and minute scratches in order to give a very smooth thin glossy film. With this combination an excellent attractive lustre can be obtained on most of the minerals. There are certain minerals, however, such as lapis, turquois and Belgium black marble which are adversely affected by using Kio. The acid causes bubbles to form on the surface and creates pores rather than eliminating them. For polishing these minerals I recommend the chrome oxide, commonly known as green putty.

Tin and titanium oxides are used, but are rather slow. On some of the harder stones lavacated alumina has been used with success. For all Calcites I still recommend Kio.

There is still plenty yet to be learned about the polishing of minerals. Possibly you may have some suggestions along this line, also you may have some questions concerning what appears in this article and previous articles. If you do please write out your questions and I will either answer them individually or in a future article.

MINERAL LIST 381 is an 8 page folder recently issued by the American Mineral Exchange, 212 Pacific Ave., Houston, Texas. It lists hundreds of desirable minerals, with their localities. A 3c stamp will secure a copy.